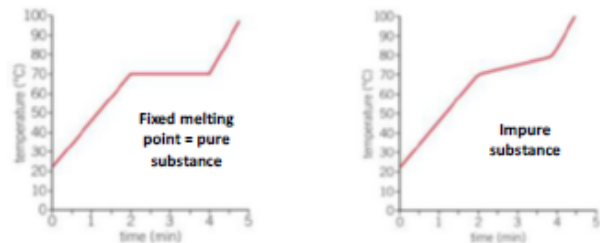


Knowledge organiser – 5.2 Separating mixtures

PURE SUBSTANCES AND MIXTURES

- Chemists make mixtures suitable to specific purposes (e.g. toothpaste and paint); they work out the best amounts of each substance to add to the mixture.
- A pure substance has a fixed melting and boiling point.
- An impure substance (mixture) will melt/boil over a range of temperatures.



DISSOLVING During dissolving, particles of solvent (water) collide with particles of solute (sugar). They surround the particles of solute, gradually moving them away until the particles are evenly spread through the solvent.

For each solute and solvent, there is a limit to the mass of solute that will dissolve in a particular volume of the solvent. When no more solute will dissolve, we say that the solution is a saturated solution.

SOLUBILITY Every substance has its own solubility. Most substances get more soluble as the temperature increases. The increase is greater for some substances than for others.

How can we separate salt from seawater?

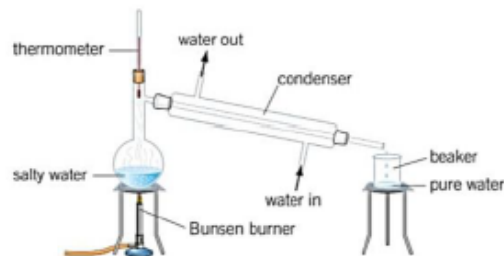
By evaporation → Pour some seawater into an evaporating dish. Heat over a water bath until some of the water has evaporated. Leave in a warm place for the rest of the water to evaporate.

How is it useful?

- Making copper sulfate crystals
- Drying of glue
- Obtaining lithium compounds from solution



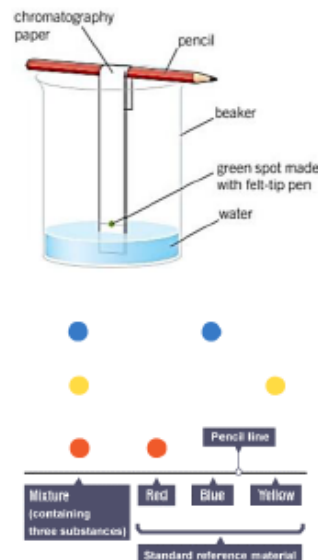
How can we get drinking water from seawater?



- On heating, water in the salt solution boils, forming steam. Salt does not boil, because its boiling point is much higher.
- Steam travels through the condenser and cools down to form liquid water.
- Liquid water drips into the beaker.

CHROMATOGRAPHY: It is often used when the dissolved substances are coloured (inks, food colourings and plant dyes). It works because some of the coloured substances dissolve in the solvent used better than others (it is attracted more strongly to the water than the paper), so they travel further up the paper.

- A pure substance will only produce one spot on the chromatogram during paper chromatography.
- Two substances will be the same if they produce the same colour of spot, and their spots travel the same distance up the paper.



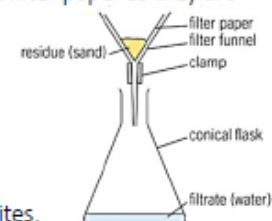
How is it useful?

- Identifying food nutrients; compare the amounts of vitamins in different food types.
- Testing the purity of a sample.
- Forensic science; finger printing and DNA analysis.
- Checking the level of pesticides, herbicides and contaminants in food and drinking water.

FILTRATION: You can separate sand and water by pouring the mixture into filter paper. Water passes through the filter paper (filtrate) as water particles are smaller than the tiny holes in the filter paper. The grains of sand (residue) stay in the filter paper as they are bigger than the tiny holes.

How is it useful?

- Separates coffee solution from ground-up coffee.
- Oil filters in cars.
- Sand filters to make water safe to drink.
- LifeStraw; fibres filter the water removing bacteria and parasites.



| KEYWORD | DEFINITION |
|--------------------|---|
| Chromatogram | An image obtained from a chromatogram. |
| Chromatography | A technique to separate mixtures of liquids (often coloured) that are soluble in the same solvent. |
| Dissolve | The complete mixing of a solute with a solvent to make a solution. |
| Distillation | A technique that uses evaporation and condensation to obtain a solvent from a solution. |
| Filtrate | The liquid or solution that collects in the container after the mixture has passed through the filter paper. |
| Filtration | A way of separating pieces of solid that are mixed with a liquid or solution by pouring through filter paper. |
| Insoluble | Cannot dissolve in a given substance. |
| Mixture | A mixture is made up of two or more pure substances that are mixed (not chemically joined) together. |
| Pure substance | A single material with no other substances mixed with it. |
| Residue | The solid that collects in the filter paper during filtration. |
| Saturated solution | A solution in which no more solute can dissolve. |
| Solubility | The maximum mass of solute that dissolves in a certain volume or mass of solvent. |
| Solubility curve | A graph showing the change in solubility of a substance with temperature. |
| Soluble | Can dissolve in a given solvent. |
| Solute | The solid or gas that is dissolved in a liquid. |
| Solvent | A substance (normally a liquid) that dissolves another substance. |